Fact Sheet

Arsenic in the Environment

Washington State Department of Health

This fact sheet provides information about arsenic in the environment, how it could affect your health, and ways to reduce the likelihood of health problems by reducing your exposure to environmental arsenic. Inside you will find details about:

Arsenic in the Environment

In the past, arsenic was commonly used as a poison to kill rodents, insects, and plants. It has no odor or taste, and just 60 milligrams of arsenic (about one-sixth the size of an aspirin tablet) added to food or drink could be fatal for an adult. Although it is rarely used today as a human poison, arsenic in the environment has become a public health concern in many parts of Washington State. Everyone has daily exposure to arsenic because it is a naturally occurring chemical element that is normally found in small amounts in water, soil, indoor house dust, air, and food. But when natural or human activities have caused greater than normal amounts of arsenic to collect in the environment, the risk of developing health problems can be increased.

Environmental arsenic is a public health issue in Washington State because:

- Drinking water in some parts of the state contains arsenic at levels that could increase the risk of health problems and that exceed legal standards established to protect public health.

- Soil in some parts of the state contains arsenic at levels that could increase the risk of health problems and that exceed legal standards established to protect public health.

- Arsenic-treated wood has been commonly used in outdoor structures such as playground equipment and decks, and regular contact could increase the risk of health problems.

Potential Sources of Arsenic Exposure

Soil and Dust

Soil in Washington State typically contains less than 7 parts of arsenic per million parts of soil (often abbreviated as 7 ppm). For comparison, 7 ppm is equivalent to adding the weight of a car key (about one-half ounce) to the weight of a sport utility vehicle (about 4500 pounds).

Past emissions from smelters in Tacoma and Everett and past use of arsenic-containing pesticides on agricultural crops have left higher than normal levels of arsenic across hundreds of square miles of soil in Washington. Levels in many areas exceed 100 ppm and can sometimes range up to several thousand ppm. This arsenic tends to bind strongly to soil and will likely remain near the surface for hundreds of years as a long-term source of exposure. The Washington State Department of Ecology has established a cleanup level of 20 ppm for arsenic in soil at most hazardous waste sites.

Water

Drinking water in Washington typically contains less than 3 parts of arsenic per billion parts of water (often abbreviated as 3 ppb). For comparison, 3 ppb is about equal to adding one teaspoon to an acre of water that is 4 feet deep.

As of 2003, the health standard for arsenic in public drinking water supplies is 50 ppb. A recent change in the federal Safe Drinking Water Act requires community water systems serving more than 25 people to reduce the level of arsenic in their water to 10 ppb by January 2006. Each year, community water systems must tell customers what level of arsenic, if any, has been detected in their water and, if the level exceeds 5 ppb, provide information about possible health effects of arsenic. Some counties in Washington have adopted rules governing arsenic in private wells, although such wells are not regulated under state or federal laws.

Drinking water can come from underground aquifers (ground water) or surface water sources (rivers and lakes). Levels of arsenic in ground water in some areas of the state exceed 10 ppb.

This is usually associated with underground aquifers located in rock or soil that have a naturally high content of arsenic. Arsenic from the rock or soil dissolves into the water that gets pumped out of the ground for use as drinking water. In Washington, very few surface water sources have arsenic concentrations that exceed 10 ppb.

It is unusual for arsenic contamination from an industrial or agricultural site to reach an aquifer, although it does happen occasionally. Most arsenic from Tacoma Smelter emissions and from pesticide applications (both of which began more than a century ago and left arsenic on the surface of the ground) is still in the top foot of the soil column. Arsenic binds strongly to soil and does not travel downward toward aquifers very quickly. However, there have been rare circumstances where water in shallow aquifers has become contaminated.

Treated Wood

Most "treated wood" contains arsenic in the form of chromated copper arsenate (CCA) to help prevent deterioration from fungus and insects. People can be exposed to the arsenic because it continually leaches to the surface of the wood. Young children playing on decks or playground equipment can get arsenic on their hands, which can then be swallowed if they put their hands in their mouths. Food placed directly on a picnic table made of treated wood can pick up some of the arsenic. Arsenic-treated wood should not be burned because breathing the smoke can result in serious health effects. The wood treatment industry has voluntarily agreed to stop using arsenic for most types of treated wood by the end of 2003, but it will be many years before existing CCA treated wood structures will be replaced with alternative materials.

Food

All foods normally contain some arsenic, but food arsenic has not been studied well enough to allow us to understand its potential to cause health problems. Most arsenic in food is in chemical forms called "organic arsenic" which aren't expected to be harmful.

Exposure to Environmental Arsenic

Arsenic has to be absorbed into your body to cause health problems. There are three main ways this can occur:

- Swallowing (ingesting) water, food, soil, or other things that contain arsenic.
- Skin or eye contact with water, soil, or other things that contain arsenic.
- Breathing (inhaling) air, dusts, or fumes that contain arsenic.

The risk to someone's health depends on the exposure to arsenic from all of these sources combined. More exposure increases the likelihood that health problems will occur. Reducing exposure reduces the risk.

Swallowing Arsenic

The majority of exposure to environmental arsenic occurs by swallowing arsenic that is present in water, soil, dust, and food. Swallowing even small amounts of arsenic-contaminated water or soil over time could lead to a variety of health problems. Much of the arsenic contained in food and water is absorbed into the body. People normally swallow small amounts of soil and dust (and any arsenic they contain). Young children often put hands, toys, pacifiers, and other things in their mouths, and these may have dirt or dust on them that can be swallowed. Soil sticking to home-grown vegetables will be swallowed when the produce is eaten. Adults may ingest soil and dust through activities such as gardening, mowing, construction work, and dusting. Airborne soil and dust from such activities usually consist of relatively large particles that get trapped in the nose, mouth, and throat and are then swallowed, rather than breathed into the lungs.

Skin Contact with Arsenic

Arsenic is not absorbed very well through the skin. Therefore, exposure from skin contact alone, such as bathing in arsenic-contaminated water, is unlikely to cause health problems.

Breathing Arsenic

Except for rare circumstances (such as workplace exposure or from burning arsenic-treated wood), inhalation exposure and the risk of developing health problems from breathing arsenic is typically small compared to ingested arsenic.

Health Effects of Arsenic

Arsenic can cause many different health problems in people. The types of health problems that may occur are influenced by many things including:

- The amount of arsenic to which a person is exposed.
- The length of time exposure occurs.
- An individual's sensitivity to the harmful effects of arsenic.

It is difficult to predict how arsenic will affect someone. Amounts that cause serious health problems for some people may have no effect on others. Also, two people with similar exposures may develop totally different health problems.

Short-term Exposure to Large Amounts of Arsenic

Swallowing relatively large amounts of arsenic (even just one time) can cause mild symptoms, serious illness, or death. Milder effects may include swelling of the face, nausea, vomiting, stomach pain, or diarrhea. Serious effects may include coma, internal bleeding, or nerve damage causing weakness or loss of sensation in the hands, arms, feet, or legs.

Levels of arsenic in Washington soil and water are generally too low to cause health effects from short-term exposure except under extremely unusual circumstances.

Long-term Exposure to Small Amounts of Arsenic

Long-term ingestion (greater than 6 months) of smaller amounts of arsenic that can be found in the environment has the potential to cause many different health problems. Illnesses strongly linked to this type of exposure include bladder cancer, lung cancer, non-melanoma skin cancer, liver cancer, prostate cancer, kidney cancer, cardiovascular disease, diabetes mellitus, damage to peripheral nerves, and changes to the pattern of color or thickness of the skin.

Many of these health problems, such as cancer, diabetes, and cardiovascular disease, are common illnesses that affect many people and have several possible causes besides arsenic. Even in areas with relatively high levels of arsenic in soil and water, we expect that most cases of these health problems will not be the result of arsenic exposure, but due to other factors such as diet, genes, lifestyle, preexisting illness, and other chemicals. At the same time, arsenic can increase the risk of developing these illnesses and is likely to contribute to some of the cases.

Medical Testing to Evaluate Your Exposure to Arsenic

Several types of tests are available to measure exposure to arsenic. Each test has certain limitations that should be considered when deciding whether to be tested, which test to use, and how to interpret the results.

Most arsenic stays in the body only a short time. Measuring the level of arsenic in urine is the best way to evaluate exposure that occurred in the last 1 - 2 days. Two types of urine tests are available. The most

common test measures the total amount of arsenic and does not distinguish between the toxic "inorganic" forms of arsenic that are of health concern and the less toxic "organic" forms that make up the majority of arsenic in seafood and other foods. High test results could occur by eating foods with high levels of the relatively nontoxic organic arsenic compounds 1 - 2 days before the test. The second type of test, for "speciated" arsenic, measures exposure to just the toxic inorganic forms of arsenic and is better for evaluating exposures relevant to your health.

Measurement of arsenic levels in hair or fingernails can be useful to evaluate longer-term exposure, but these tests are usually difficult to interpret because:

- There are no standardized procedures for conducting the tests.
- There are no widely accepted standard values to distinguish "normal" from "elevated" test results.

Reducing Your Exposure to Arsenic

There are ways to reduce your exposure if your drinking water or soil contains greater than normal amounts of arsenic. The following paragraphs provide a few suggestions for reducing exposure to arsenic-contaminated water, soil, or CCA-treated wood and tell where to get more detailed information.

Reducing Exposure to Arsenic-Contaminated Drinking Water

Many water filters on the market today are designed to improve the taste and remove odors from drinking water but do not remove arsenic.

There are, however, home water treatment systems available that are capable of removing arsenic from drinking water. Point-of-entry equipment, commonly referred to as whole-house systems, treat all the water used in the house and are commonly located near where the water service line enters the house. Point-of-use systems treat water at a single tap, such as a kitchen sink faucet.

NSF International, a not-for-profit public health and safety company provides product testing and certification services of home water treatment products. DOH recommends that you only install NSF certified home water treatment systems in your home. Some NSF certified products may not be effective in all cases. Testing after installation and routine maintenance should be performed to ensure that the system is removing arsenic from the water.

Bottled water is another option for reducing your exposure to arsenic in drinking water. However, bottled water can contain up to 50 ppb arsenic until 2006. DOH recommends that you ask the bottled water company about the arsenic levels, if any, contained in their product.

For more information about home water treatment systems, visit the NSF web site at http://www.nsf.org/.

For more information about arsenic in drinking water, visit the DOH web site at http://www.doh.wa.gov/ehp/dw or call the DOH, Division of Drinking Water toll free line at 800-521-0323.

Reducing Exposure to Arsenic-Contaminated Soil

Although anyone can be exposed to arsenic in soil, young children who are in close contact with dusty floors and outdoor dirt are more likely than others to swallow contaminated soil and dust that gets on their hands and toys. Reducing their exposure involves covering, removing, or avoiding contaminated soil, and washing children's hands and faces with soap and water when they get dirty. Contaminated soil can be brought inside the home by the wind and on shoes and pets. Taking off your shoes before coming inside, keeping pets clean, and regular damp mopping and dusting will help keep indoor dust levels down.

Adults can reduce exposure to contaminated soil when gardening or doing yard work by dampening dusty soils (or wearing a dust mask) in dry conditions, wearing gloves, and washing up with soap and water before eating. Vegetables and fruits grown in contaminated soil should be washed thoroughly before eating.

For more information on ways to reduce your exposure to arsenic-contaminated soil, call the DOH Office of Environmental Health Assessments at 877-485-7316 or visit the following web site: http://www.metrokc.gov/health/hazard/resultsfaq.htm#precautions

Reducing Exposure to CCA-Treated Wood

Washing children's hands with soap and water after they have played on CCA-treated wood structures will reduce their exposure to the arsenic that leaches out of the wood. Sealing CCA-treated wood with an oil-based stain every one or two years can help reduce exposure by reducing the arsenic residues at the surface of the wood. Do not burn CCA-treated wood because the smoke is extremely hazardous. If you plan to build play equipment or other outdoor structures, ask your lumber supplier about alternatives to CCA-treated wood.

For more information about CCA-treated wood and ways to reduce your exposure, call the DOH Office of Environmental Health Assessments at 877-485-7316 or visit the following web site: http://www.dph.state.ct.us/Publications/BCH/EEOH/pressurtr.pdf

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ALWAYS WORKING FOR A SAFER AND HEALTHIER WASHINGTON

Public health agencies in Washington provide critical programs and services for all people in the state – from drinking water protection to disease prevention. The public health network coordinates at the local, statewide and national level to keep our communities healthy and safe. The work of public health includes:

- **Essential programs for improving health:** Programs such as immunizations, communicable disease prevention, and chronic disease and injury prevention help individuals and communities stay healthy.

- **Information that works:** Resources such as educational and training programs, community health reports and statewide health and safety information provide individuals and communities information they can use to make good decisions.

Protecting you and your family every day: Services such as drinking water and air quality monitoring, septic system inspections, restaurant inspections, disease prevention and planned community crisis response ensure individual and community health and safety.

The Department of Health is an equal opportunity agency. If you need this publication in an alternative format, please call 1-800-527-0127 (voice) or 1-800-833-6388 (TDD relay service). For additional copies of this publication, call the Office of Environmental Health Assessments at 1-877-485-7316. This and other publications are available on the Internet: at: http://www.doh.wa.gov/ehp/factsheets.htm